

## **FAMILY OF MEDIUM TACTICAL VEHICLES (FMTV)**



### **Army ACAT IC Program**

Total Number of Systems:	85,488
Total Program Cost (TY\$):	\$17.0B
Average Unit Cost (TY\$):	\$199.0K*
Full-rate production:	FY95

### **Prime Contractor**

Stewart & Stevenson

\* \$135.0K in FY96 constant dollars based on a weighted average of 16 models

### **SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2010**

The Family of Medium Tactical Vehicles (FMTV) consists of fourteen variants of tactical wheeled vehicles based on a common truck cab, chassis, and internal components and two tactical trailers. The components are primarily non-developmental items integrated in rugged tactical configurations. The light-medium tactical vehicles are 2.5-ton payload capacity models consisting of cargo, airdrop cargo, and van variants. The medium tactical vehicles are 5-ton payload capacity models consisting of cargo (with and without material handling crane), long wheel base cargo (with and without material handling crane), airdrop cargo, tractor, wrecker, dump, airdrop dump, fuel tanker, and expandable van variants. The 11,437 trucks produced to date are designated the A0. The Army approved an automatic braking system and an Environmental Protection Agency compliant engine for production as model A1.

FMTV supports *Joint Vision 2010* objectives: *focused logistics* through the transport of troops, fuel and water distribution, ammunition distribution, and general cargo transport; and *information superiority* by providing mobility of shelters that contain the new generation of automated systems, sophisticated management information systems, and communications links. FMTV also supports *precision engagement* as the prime mover for towed artillery and as the chassis for the High Mobility Artillery Rocket System (a Multiple Launch Rocket System derivative on a wheeled chassis).

## **BACKGROUND INFORMATION**

The acquisition strategy includes the LRIP award in October 1991 for 10,843 vehicles. There was a deferred production and separate R&D effort for companion trailers (2.5- and 5-ton) and a medium tactical vehicle expandable van. The Army made the full-rate production decision in August 1995. The Army made a production decision on September 9, 1999 for an additional 1,552 vehicles.

Operational testing was conducted at Ft. Bragg, NC, in three phases: *Phase I*, September-December 1993, was terminated for poor demonstrated reliability. *Phase II*, conducted June-November 1994, was interrupted and canceled when the soldiers of the test unit deployed to Haiti. *Phase III*, conducted April-July 1995, was the basis of the DOT&E B-LRIP report.

While the system proved effective and suitable, there were certain safety deficiencies detailed in the report to Congress that needed to be corrected before fielding. The Army made the corrections and confirmed the fixes in an abbreviated operational assessment performed in December 1995.

While the FMTV was found to be effective and suitable in operational testing in temperate zones, technical testing under Arctic conditions uncovered starting and braking problems and seal leaks. These problems have been fixed and their solutions confirmed with the testing of an A1 wrecker and medium cargo truck in Arctic conditions at Ft. Greely, AK, in early 1999.

In early 1998, there were several incidents in which the front U-joint on the rear driveshaft of the 2.5-ton variants failed. This failure causes the driveshaft to whip around, sever the air-brake line, and (by design) lock the brakes. Investigation by the Army uncovered a previously unknown driveline resonance that occurs at speeds in excess of 40 miles per hour. Consequently, a worldwide safety-of-use message was issued limiting the driving speed to 30 miles per hour. The Army determined that the driveline resonance causes the flywheel housing to crack as well as the driveshaft to fail. All of approximately 7,000 FMTVs that had been fielded were inspected for these failures, and about 180 vehicles with cracks in their flywheel housing were found. A number of alternative design changes to the flywheel housing and driveshaft were investigated and formally tested. The final solution was a more robust flywheel housing design cast out of nodular iron, and a less flexible driveshaft with a more sturdy U-joint design.

Developmental testing of the A1 model truck in FY98-99 uncovered several additional problem areas, and new performance, reliability, and safety issues have arisen: leaf spring breaks, electromagnetic interference from the new engine electronic control module, and frame integrity. Frame integrity is perhaps the most troubling since it may be the most difficult to fix. After extended lift towing of a fully loaded vehicle over a cross-country like test course, it was discovered that plastic (that is, permanent) deformation of the frame had occurred. Several suggested solutions have the potential to fix the problem, but with as yet unknown consequences to mobility, handling, and safety. In addition to these issues, the project manager is working on fixes for numerous other hardware issues reported from the field.

## **TEST & EVALUATION ACTIVITY**

DOT&E approved the FMTV TEMP on July 1, 1999. OT&E activity in FY99 consisted of planning activities in support of beginning an evaluation of an A1 model Maintenance Demonstration and Integrated Electronic Technical Manual verification and IOT&E of the remaining variants in late FY00.

There was extensive developmental testing of the proposed fixes for the flywheel housing and driveshaft failures. Six trucks with the new flywheel housing and driveshaft designs were successfully tested.

## **TEST & EVALUATION ASSESSMENT**

The operational test of FMTV in 1995 was adequate to provide the information necessary to determine its operational effectiveness and suitability given the user defined mission profile. This mission profile for the truck models is defined to be 20 percent on primary roads, 50 percent on secondary roads, 15 percent on trails, and 15 percent on cross-country. The operational testing was carried out in as realistic an operational environment as could be achieved within the constraints of available test ranges, resources, and safety. The test fleet drove more than 200,000 miles. FMTV is operationally effective, based upon the demonstrated fleet-wide probability of mission success of 0.96.

Overall, FMTV is operationally suitable as tested in 1995. The tested FMTV fleet demonstrated better than the required reliability and operational availability. Based on test results, the trucks required less maintenance than allowed.

The failure modes of the flywheel housing and driveshaft have not recurred. However, the leaf spring, electromagnetic interference, and frame integrity issues remain to be resolved.

## **CONCLUSIONS, RECOMMENDATIONS, LESSONS LEARNED**

Initial operational test and evaluation in 1995 did not find the failure modes of the flywheel housing and driveshaft, which were discovered in 1998. These failure modes occur when the trucks are driven extensively at speeds greater than 45 miles per hour for extended trips. It had been assumed that the unimproved road and cross-country mission profile of the IOT&E was a difficult and strenuous, but fair, test of the trucks design. Mission use requires speeds greater than 45 miles per hour in both peacetime and battle for re-supply.

Frame deformation was first discovered in very strenuous testing involving a fully loaded FMTV cargo truck lift-towed from the front for 1,000 miles. The purpose of the test was to evaluate a towing fixture to be used with the Heavy Expanded-Mobility Tactical Truck wrecker. The frame deformation in this case was clearly visible. Subsequent testing over a much less strenuous regime revealed deformation observable only with instrumentation. Future developmental testing should include assessment of the most strenuous threats to the integrity of the vehicle, and specific instrumented testing should be performed.

